

Important Latin Roots					
Semi	Perm	Bi	Phospho	Endo	Ecto
• Some/ part	• To Pass	• 2	• Containing phosphate	• Inside	• Outside

---

---

---

---

---

---

---

---

### Practice Exam Question

The scale of life at the cellular level can be difficult to understand. The scale on this chart is logarithmic. Each line represents a factor of 10. Compared to a typical animal or plant cell (about 100 μm in diameter), how much smaller is a mitochondria?

- Mitochondria and animal cells are essentially the same size.
- The length of mitochondria is about 1/10 the diameter of an animal cell.
- The length of mitochondria is about 1/100 the diameter of an animal cell.
- The length of mitochondria is about 1/1,000 the diameter of an animal cell.

---

---

---

---

---

---

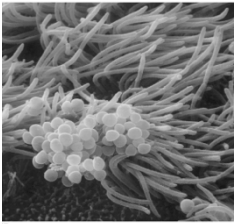
---

---


### Cell Theory

**Cell Theory: All life made of cells, all cells come from other cells!**


**The Cell is the smallest subunit of life**



Multicellular organism



Single celled organism



Multicellular organism

---

---

---

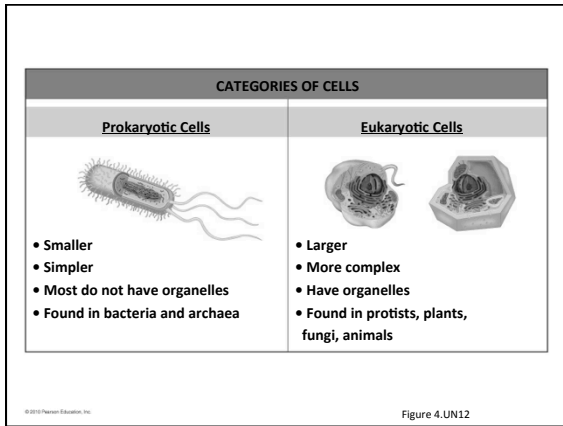
---

---

---

---

---




---

---

---

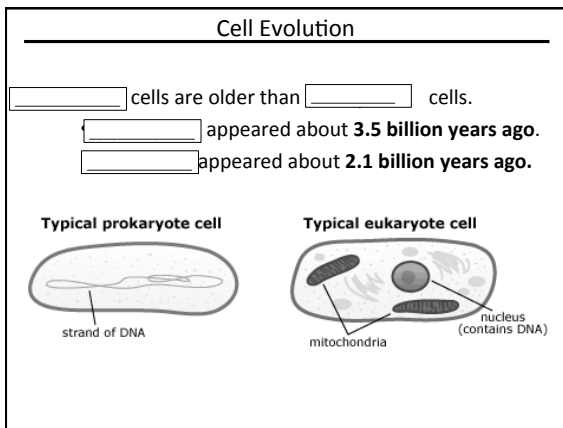
---

---

---

---

---




---

---

---

---

---

---

---

---

**Practice Exam Question**

The three domains of life described by biologists today are Bacteria, Archaea, and Eukarya. What is the principal difference between eukaryotes (domain Eukarya) and prokaryotes (domains Archaea and Bacteria)?

- Prokaryotes do not have a plasma membrane surrounding the cell.
- Prokaryotes use RNA and not DNA to pass on the genetic message.
- In eukaryotes, the interior of the cell is divided by internal membranes into specialized compartments.
- Eukaryotes engage in cellular metabolism, whereas prokaryotes do not.

---

---

---

---

---

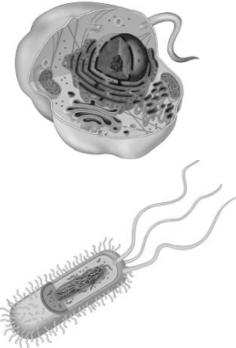
---

---

---

**All Cells Have:**

- **These basic features:**
  - They are all bound by a **plasma membrane.**
  - All cells have **DNA**
    - **Ribosomes** (tiny structures that build proteins)
  - The region between the nucleus (Eukaryote) or nucleoid region (Prokaryote) and plasma membrane is the **cytoplasm**




---

---

---

---

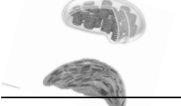
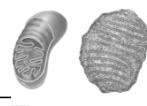
---


---

---

---

**CHLOROPLASTS AND MITOCHONDRIA:  
ENERGY CONVERSION**

<p><b>Chloroplasts</b></p> <p>Most of the living world runs on the energy provided by <b>photosynthesis.</b></p> <ul style="list-style-type: none"> <li>• <b>Photosynthesis</b> = conversion of solar energy to chemical energy of sugar.</li> <li>• <b>Chloroplasts</b> are the organelles that perform photosynthesis.</li> </ul> 	<p><b>Mitochondria</b></p> <p><b>Mitochondria</b> = organelles used for cellular respiration</p> <ul style="list-style-type: none"> <li>• Cell Respiration = produce ATP (energy molecules) from the energy of food molecules.</li> <li>• Mitochondria are found in almost all eukaryotic cells – including plants!!!</li> </ul> 
---	--

 Power Plant

---

---

---

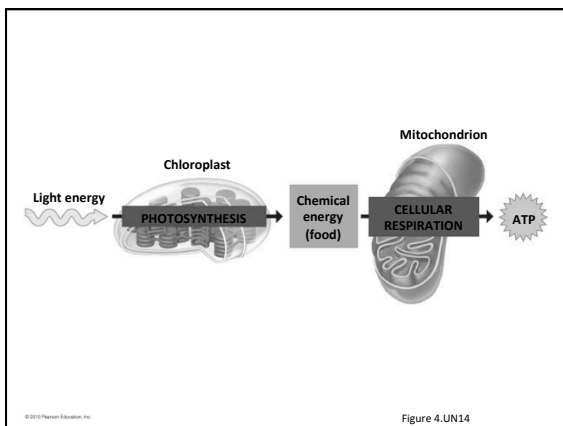
---

---

---

---

---




---

---

---

---

---

---

---

---

**Summary from Textbook**

**From Lec 2:  
Name that Kingdom!**

---

---

---

---

---

---

---

---

**What do these two energy producing Organelle have in common?**

---

---

---

---

---

---

---

---

**Maintaining Structure**

**Cytoskeleton:**

- Protein based microtubules or microfilaments
- Maintains cell shape
- Holds organelles in place or allows movement

Wood, cement, steel beams

**Misconception:**  
Can move, but don't function to move organelle around the cell

(a) Microtubules in the cytoskeleton

---

---

---

---

---

---

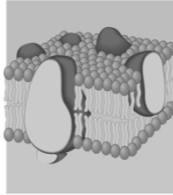


---

---

### Regulation

**Plasma Membrane:**

- Regulates what comes in and out.
  - Semi-Permeable: Only some things can come in and only some things can get out.
    - Factors involved:
      - Size
      - Charge

---

---

---

---

---

---

---

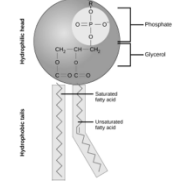
---

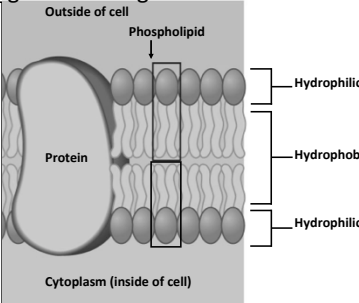
### Regulation

**Plasma Membrane – Structure:**

- The plasma membrane separates the living cell from its nonliving surroundings.

**Phospholipid Bilayer**





- The membranes of cells are composed mostly of
  - Phospholipids
  - Proteins

---

---

---

---

---

---

---

---

### The Process of Science: What Makes a Superbug?

---

- Observation:** Bacteria use a protein called PSM to disable human immune cells by forming holes in the plasma membrane.
- Question:** Does PSM play a role in MRSA infections?
- Hypothesis:** MRSA bacteria lacking the ability to produce PSM would be less deadly than normal MRSA strains.

---

---

---

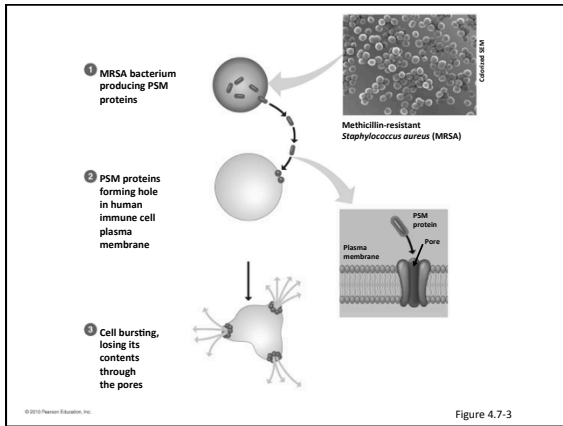
---

---

---

---

---




---

---

---

---

---

---

---

---

– **Experiment:** Researchers infected

- Seven mice with normal MRSA
- Eight mice with MRSA that does not produce PSM

– **Results:**

- All seven mice infected with normal MRSA died.
- Five of the eight mice infected with MRSA that does not produce PSM survived.

– **Conclusions:**

- MRSA strains appear to use the membrane-destroying PSM protein, but
- Factors other than PSM protein contributed to the death of mice

---

---

---

---

---


---

---

---

### Nucleus

- **Command Center:**  
Contains the Genetic Material (DNA)
  - The nucleus is bordered by a double membrane called the **nuclear envelope**.
  - **Pores** in the envelope allow materials to move between the nucleus and cytoplasm.
  - The nucleus contains a **nucleolus** where ribosomes are made.



Principle - Management Office

---

---

---

---

---

---

---

---

### Ribosomes

- **Ribosomes are responsible for protein synthesis.**
  - Ribosome components are made in the nucleolus but assembled in the cytoplasm.

Carpenter:  
Make Everything

---

---

---

---

---

---

---

---

### Making Proteins

- Ribosomes read DNA into Protein

**Process of Making Proteins**

- 1) DNA become mRNA
- 2) mRNA leaves Nucleus
- 3) Ribosome clamps onto mRNA
- 4) Reads the mRNA into Amino Acids
- 5) Amino Acids assemble into protein

© 2010 Pearson Education, Inc.

---

---

---

---

---

---

---

---

### Endomembrane System: Rough Endoplasmic Reticulum

- The “rough” in the **rough ER** is due to ribosomes that stud the outside of the ER membrane.
- These ribosomes **produce membrane proteins and secretory proteins.**
- After the rough ER synthesizes a molecule, it packages the molecule into **transport vesicles.**

Conveyer Belt: Production line in a factory

---

---

---

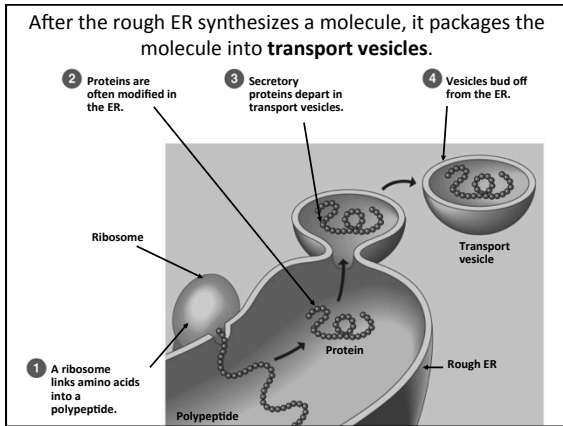
---

---

---

---

---




---

---

---

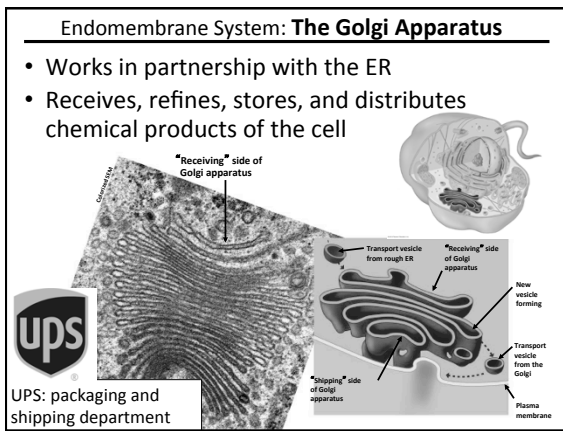
---

---

---

---

---




---

---

---

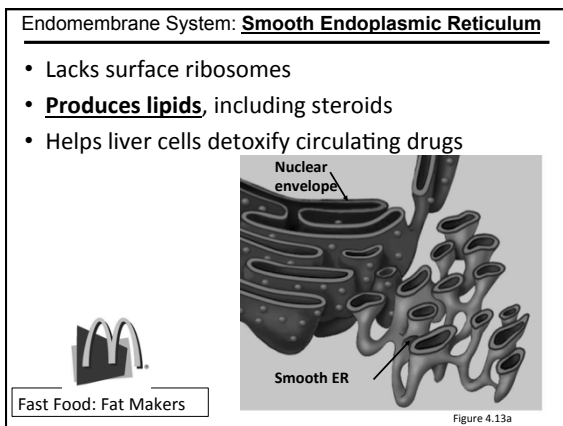
---

---

---

---

---




---

---

---

---

---

---

---

---

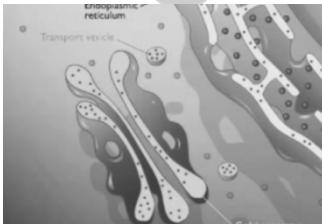


**Endomembrane System: Lysosome**

**Cleaning up Wastes** = a sac of digestive enzymes found in most animal cells and some plants.

- Enzymes in a lysosome can break down large molecules, bacteria, old organelles, etc.
- Also used for single celled eating

**PLAY**




---

---

---

---

---

---

---

---

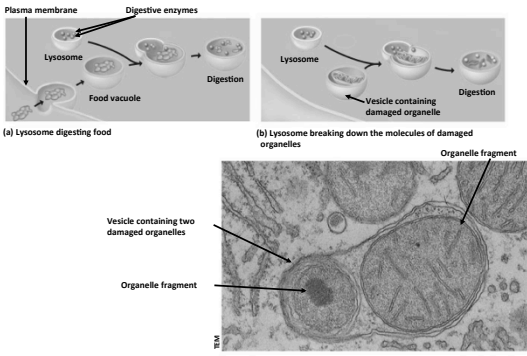


Figure 4.16

---

---

---

---

---

---

---

---

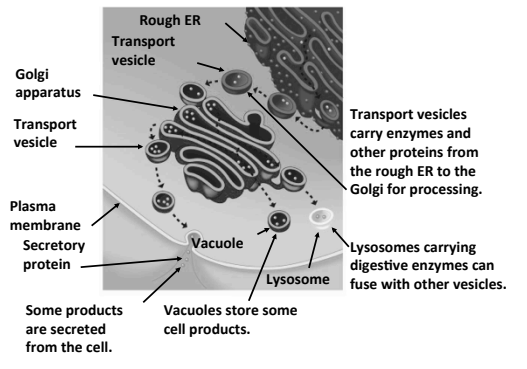


Figure 4.18a

---

---

---

---

---

---

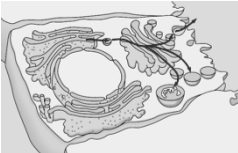
---

---

**Practice Exam Question**

**The cell is sometimes described as a protein factory. Using the cell-as-factory analogy, which of the following accurately describes the functions of the endomembrane system?**

- a. The ribosomes on the rough endoplasmic reticulum are analogous to a production line in a factory.
- b. The Golgi apparatus is analogous to the packaging and shipping department.
- c. The nucleus is analogous to management offices.
- d. All of the above



---

---

---

---

---

---

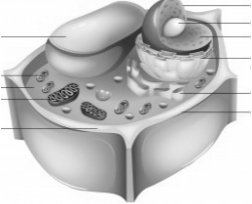
---

---

**Differences between plants and animal cells:**

**Plant Cell**

- 1. Central Vacuole:
  - Store nutrients
  - Absorb water
  - May contain pigments or poisons
  - Contain digestive enzymes
- 2. Cell Wall
- 3. Chloroplasts



---

---

---

---

---

---

---

---

**Practice Exam Question**

- You are told that the cells on a microscope slide are plant, animal, or bacterial cells. You look through the microscope and see ribosomes, mitochondria, and a nucleus. You conclude the cells must be:
  - a. plant cells
  - b. animal cells
  - c. bacterial cells
  - d. animal or plant cells
  - e. animal or bacterial cells

---

---

---

---

---

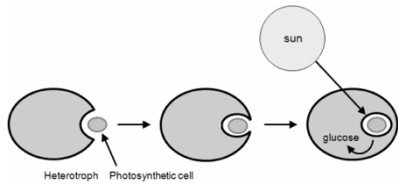
---

---

---

Lynn Margulis and the Endosymbiotic Hypothesis of Cell Evolution

- Mitochondria and chloroplasts contain their own DNA, which encodes some of their proteins.
- This DNA is evidence that mitochondria and chloroplasts evolved from free-living prokaryotes in the distant past.



---

---

---

---

---

---

---

---